

# Dold UG6960 Series Safety Relay Light Curtain with Adjustable Delay



Designed to protect people and machines in applications with light curtains.

- Various delay functions adjustable at device (power off before selecting the desired function):
  - Release delay
  - Release delay retriggerable
  - On delay
  - Fleeting on make / break
  - Delay function settable via potentiometer

**Note: See Delay Functions for more information.**

- According to:
  - Performance Level (PL) e and category 4 to EN ISO 13849-1: 2008
  - SIL Claimed Level (SIL CL) 3 to IEC/EN 62061
  - Safety Integrity Level (SIL) 3 to IEC/EN 61508 and IEC/EN 61511
  - Acc. to EN 50156-1 for furnaces
- Line fault detection ON pushbutton
- Manual restart or automatic restart
- Without cross fault monitoring

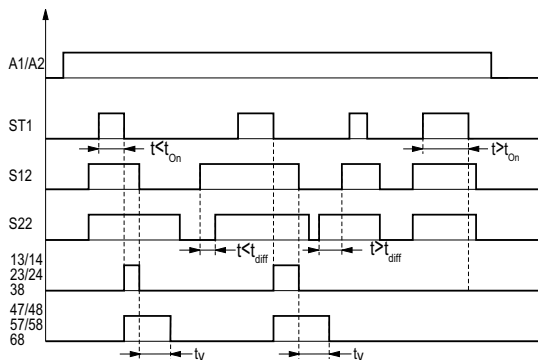
- 2-channel
- Forcibly guided output contacts
- Output: max. 2 N.O. instantaneous semiconductor monitoring outputs, 2 N.O. time-delay guided contacts, 1 instant monitoring contact, and 1 time-delayed monitoring contact
- LED indicator for operation, delay contacts and failure
- Pluggable terminal blocks for easy exchange of devices
- Two PNP sensor inputs only



Safety Relays Selection Chart				
Part Number	Price	Marking Type	Voltage	Outputs
UG6960-04PS800-300	\$235.00	Safety Relay Light Curtain	24 VDC	2 N.O. instantaneous positive guided safety contact(s), 2 N.O. time delay (selectable) positive guided safety contact(s), 1 N.O. instantaneous monitoring contact, 1 N.O. time delay monitoring contact

Safety Data – Values per EN ISO 13849-1	
Category	4
Performance level	PLe
MTTF <sub>d</sub>	584.5 years
DC <sub>avg</sub>	99%
Safety Data – Values per IEC/EN 62061 / IEC/EN 61508	
SIL CL	3
SIL	3
HFT (Hardware Failure Tolerance)	1
DC <sub>avg</sub>	99%
SFF	99.7%
PFFH <sub>D</sub>	3.59E-10 h <sup>-1</sup>

## Function Diagram

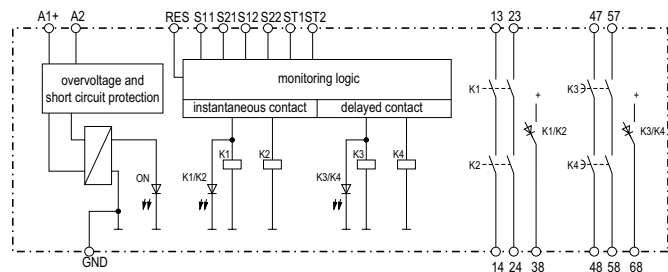


$t_{diff}$ : max. time delay for simultaneity demand dependent on selected safety function  
 E-Stop, safety gate, safety mat  $t_{diff}$ : max. 3s  
 Light curtains  $t_{diff}$ : max. 1s  
 Two-hand control  $t_{diff}$ : max. 0.5s  
 other times on request

$t_{on}$ : max. actuation time of start button  
 Standard  $t_{on}$ : max. 3s  
 other times on request

$t_v$ : Time delay  
 Example: release delay

## Block Diagram



# Dold UG6960 Series Safety Relay Light Curtain with Adjustable Delay

Dold UG6960 Series Safety Relay Light Curtain with Adjustable Delay Specification Table	
<b>General Specifications</b>	
<b>Temperature</b>	Storage: -25°C to 85°C (-13°F to 185°F) Operating: -15°C to 55°C (5°F to 131°F)
<b>Altitude</b>	<2,000 meters
<b>Vibration Resistance</b>	Amplitude: 0.35mm, Frequency: 10 to 55 Hz (IEC/EN 60-068-2-6)
<b>Degree of Protection</b>	Per IEC/EN 60 529. Housing: IP40; Terminals IP20
<b>Housing</b>	UL 94V-0 Thermoplastic
<b>Weight</b>	250g (8.82 oz.)
<b>Terminal Designation per EN 50 005</b>	1x4 mm <sup>2</sup> solid or 1 x 2.5 mm <sup>2</sup> stranded ferruled (isolated) or 2 x 1.5 mm <sup>2</sup> stranded ferruled (isolated) DIN 46 228-1/-2/-3/-4 or 2 x 2.5 mm <sup>2</sup> solid DIN 46 228-1/-2/-3/-4
<b>Wire Connections</b>	
<b>Wire Fixing</b>	Terminal screws M3.5 box terminals with wire protection.
<b>Wire Connection</b>	60degC/75degC Copper conductors only; AWG20-12 Sol/Str Torque 0.5NM
<b>Input Specifications</b>	
<b>Nominal Voltage</b>	24VDC
<b>Voltage Range</b>	At 10% residual ripple: AC/DC: 0.9 to 1.1 U <sub>N</sub> ; AC: 0.85 to 1.1 U <sub>N</sub>
<b>Maximum Consumption</b>	DC approx. 3.2 W
<b>Nominal Frequency</b>	Not applicable
<b>Minimum Off-time</b>	250 ms
<b>Control Voltage on S11 At U<sub>N</sub></b>	22VDC
<b>Control Current Typ. Over S12, S22</b>	8mA at U <sub>N</sub>
<b>Min. Voltage on S12, S22 (relay activated)</b>	20VDC
<b>Short Circuit Protection</b>	Internal with PTC (Positive Temperature Coefficient resistor)
<b>Overvoltage Protection</b>	Internal VDR (Voltage Dependent Resistor)
<b>Output Specifications</b>	
<b>Electrical Contact Life</b>	AC 15 at 5A, 230VAC: > 1.5x10 <sup>5</sup> switching cycles
<b>Mechanical Life</b>	> 10x10 <sup>6</sup> switching cycles
<b>Contact Type</b>	2 N.O. instantaneous contacts 2 N.O. delayed contacts (N.O. contacts are safety contacts)
<b>Operate Delay</b>	Manual start: 30 ms; automatic start: 350 ms. E-Stop (1) (6), Safety gate (2) (7), Exclusive or contacts (5): Start up at U : < 65 ms
<b>Release Delay</b>	Light curtains (8) Start up at U : < 35 ms Release delay at U and disconnecting the supply: < 40 ms Release delay at U and disconnecting S12,S22: < 25 ms
<b>Nominal Output Voltage</b>	24VDC: See continuous current limit curve in installation manual.
<b>Thermal Current (I<sub>th</sub>)</b>	Max. 8A. See continuous current limit curve in installation manual.
<b>Short Circuit Strength</b>	Max. fuse rating: 6A gL (IEC/EN 60 947-5-1); Line circuit breaker: B 6A
<b>Switching Capacity (IEC/EN 60 947-5-1)</b>	AC 15: N.O. contacts: 3A/230V DC 13: N.O. contacts: 2A/DC24V.
<b>Switching Frequency</b>	instantaneous: Max. 1800 switching cycles/hr delayed: Max. 360 switching cycles/hr
<b>Agency Approvals and Standards</b>	CSA, cULus file E107778, CE, RoHS, TUV

To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page at [www.automationdirect.com](http://www.automationdirect.com)

**Release Delay:** When disconnecting the signal the contacts remain closed and only open after the time is finished. Restarting the unit during time delay has no influence. The time has to run down fully before you can restart the unit.

**Release Delay Retriggerable:** Same as above, but you can restart the unit while the time is running and before the contacts open.

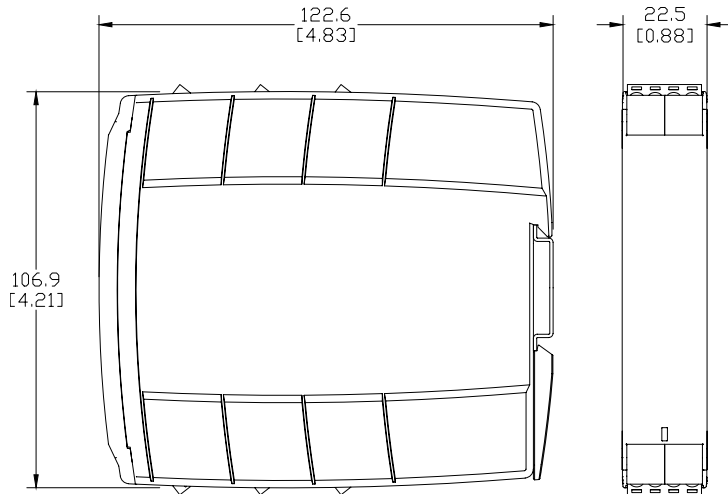
**On Delay:** The output contacts are energized after the adjusted time after restarting the unit.

**Fleeting on Make:** The output contacts are energized after restarting the unit for the adjusted time, and then go off again.

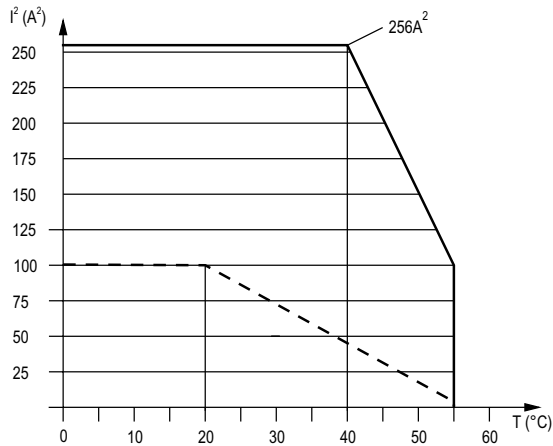
**Fleeting on Break:** The output contacts are energized for the adjusted time after disconnecting the signal, and then go off again.

# Dold UG6960 Series Safety Relay Light Curtain with Adjustable Delay

## Dimensions mm [in]



## Characteristic Curves



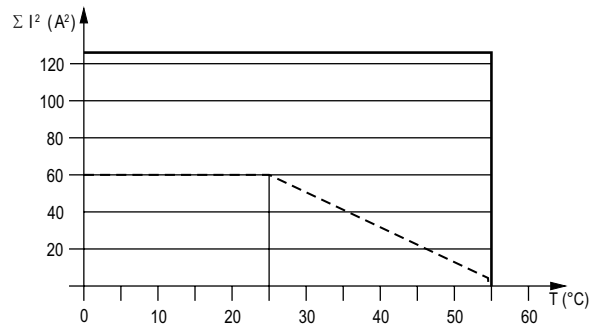
— device free-standing  
max. current at 55°C over  
4 contact path =  $5A \cong 4 \times 5^2 A^2 = 100A^2$

- - - device mounted without distance heated by  
devices with same load,  
max. current at 55°C over  
4 contact path =  $1A \cong 4 \times 1^2 A^2 = 4A^2$

$$\Sigma I^2 = I_1^2 + I_2^2 + I_3^2 + I_4^2$$

$I_1, I_2, I_3$  - current in contact paths

Quadratic total current limit curve output contacts



— AC 230V device mounted on distance with air circulation.  
max. current at 55°C over  
5 contact path =  $5A \cong 5 \times 5^2 A^2 = 125A^2$

- - - AC 230V device mounted without distance heated by  
devices with same load,  
max. current at 55°C over  
5 contact path =  $1A \cong 5 \times 1^2 A^2 = 5A^2$

Quadratic total current

$$\Sigma I_{th}^2 = I_{th1}^2 + I_{th2}^2 + I_{th3}^2 + I_{th4}^2 + I_{th5}^2$$

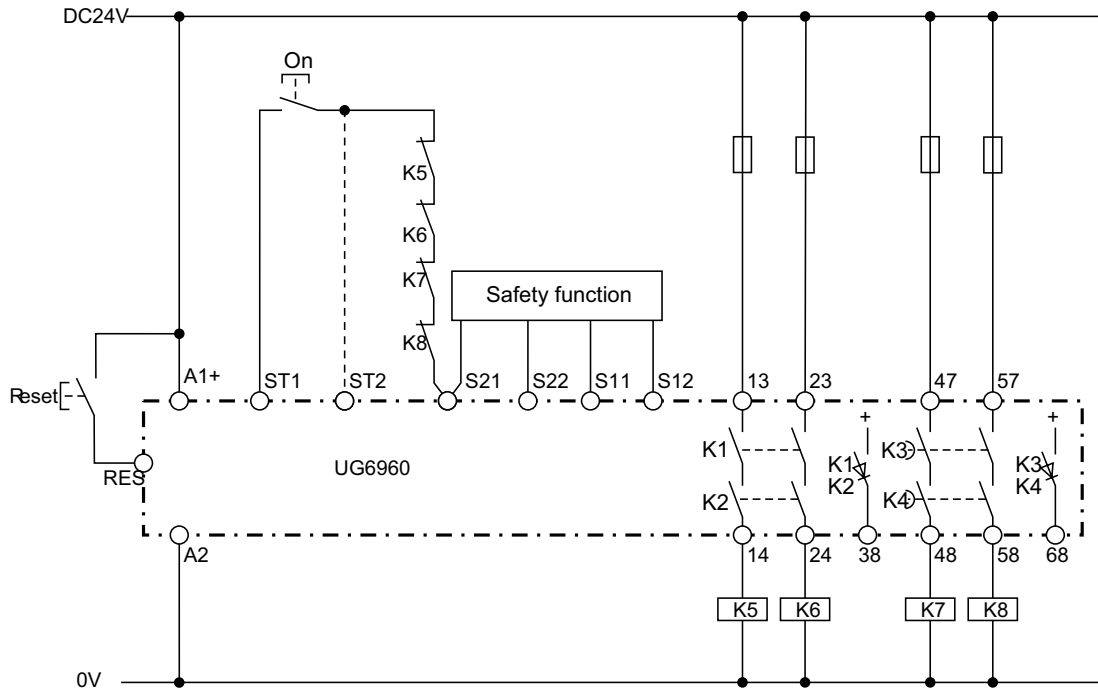
$I_{th1}, I_{th2}, I_{th3}, I_{th4}, I_{th5}$  : current in contact paths

Quadratic total current limit curve AC 230 V

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# Dold UG6960 Series Safety Relay Light Curtain with Adjustable Delay

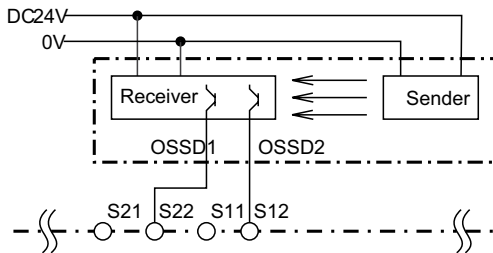
## Application Examples



Safety function: see below, Manual-Start (for automatic start make a bridge to ST2 instead of ON button).

Delay function: release delay (1)

K1/K2 instantaneous contact, K3/K4 delayed contact



Fct.: Light curtain (8),  
without cross fault detection  
SIL 3, PL e, Cat. 4 <sup>2)</sup>

2) To achieve the stated safety classification light curtains with selftest (type 4) according to IEC/EN 61496-1 have to be used.

# Dold LG5929 Extension Module



Additional contacts for emergency-stop modules and safety gate monitors.

- 1-channel or 2-channel connection
- LED indication for operation
- Output: 5 N.O. and 1 N.C. contacts

## Safety Data – Values per EN ISO 13849-1

Category	4 according to EN 954-1
Performance level	PLe according to EN 13849-1
MTTF <sub>d</sub>	>100 years
DC <sub>avg</sub>	99%

## Safety Data – Values per IEC/EN 62061 / IEC/EN 61508

SIL CL	3 per IEC/EN 62061
SIL	3 per IEC/EN 61508
HFT (Hardware Failure Tolerance)	1
DC <sub>avg</sub>	99%
SFF	99.7%
PFF <sub>D</sub>	4.68E-10 h <sup>-1</sup>

## Safety Relays Selection Chart

Part Number	Price	Marking Type	Voltage	Outputs
<b>LG5929-60-100-61</b>	\$95.00	Safety relay extension module	24 VAC/VDC	5 N.O./1 N.C.

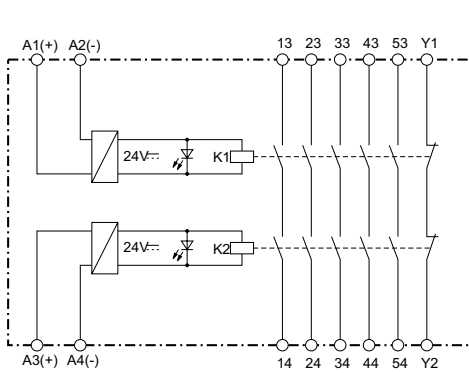
## Safety Relay Extension Module Specification Table

General Specifications	
<b>Temperature</b>	Storage: -25°C to 85°C (-13°F to 185°F) Operating: -15°C to 55°C (5°F to 131°F)
<b>Altitude</b>	< 2,000 meters
<b>Vibration Resistance</b>	Amplitude: 0.35mm, Frequency: 10 to 55 Hz (IEC/EN 60-068-2-6)
<b>Degree of Protection</b>	Per IEC/EN 60 529. Housing: IP40; Terminals IP20
<b>Housing</b>	UL 94V-0 Thermoplastic; Din mount 35 mm x 7.5 mm
<b>Weight</b>	205g (7.23 oz.)
<b>Agency Approvals and Standards</b>	CSA, cULus file E107778, CE, RoHS, TUV
<b>Terminal Designation per EN 50 005 Wire Connections</b>	1x4 mm <sup>2</sup> solid or 1 x 2.5 mm <sup>2</sup> stranded ferruled (isolated) or 2 x 1.5 mm <sup>2</sup> stranded ferruled (isolated) DIN 46 228-1/-2/-3/-4 or 2 x 2.5 mm <sup>2</sup> solid per DIN 46 228-1/-2/-3 /-4
<b>Wire Fixing</b>	Plus-minus terminal screws M3.5 box terminals with wire protection or cage clamp terminals.
Input Specifications	
<b>Nominal Voltage</b>	24V AC/DC
<b>Voltage Range</b>	AC: 0.85 to 1.1 U <sub>N</sub> At 10% residual ripple: 0.9 to 1.1 U <sub>N</sub> ; At 48% residual ripple: 0.85 to 1.1 U <sub>N</sub>
<b>Maximum Consumption</b>	24VAC/DC: 1.8VA
<b>Nominal Frequency</b>	50 to 60 Hz
<b>Control Current</b>	Control current typ. at 24V over 2 relays: 75 mA
<b>Overvoltage Protection</b>	Internal VDR (Voltage Dependent Resistor)
Output Specifications	
<b>Electrical Contact Life</b>	To AC15 at 2 A,230V: 10 <sup>5</sup> switching cycles IEC/EN 60 947-5-1
<b>Mechanical Life</b>	20 x 10 <sup>6</sup> switching cycles
<b>Contact Type</b>	5 N.O. positively driven and 1 N.C. relay contacts ( <b>N.O. contacts are safety contacts</b> )
<b>Operate/Release Time</b>	Operate typ at U <sub>N</sub> : 20 ms.; Release typ at U <sub>N</sub> : 35 ms.
<b>Nominal Output Voltage</b>	250VAC
<b>Thermal Current (I<sub>th</sub>)</b>	Max. 5A per contact. See continuous current limit curve in installation manual.
<b>Short Circuit Strength</b>	Max fuse rating:10A gl (IEC/EN 60 9470-5-1); Line circuit breaker: B6A
<b>Switching Capacity IEC/EN 60 947-5-1</b>	AC 15: N.O. contacts: 3A/230V; N.C. contacts: 2A/230VAC DC 13: N.O. contacts: 4A/24V; N.C. contacts: 4A/24VDC; N.O. contact: 8A/24V >25x10 <sup>3</sup> ON: 0.4s, OFF: 9.6s
<b>Switching Frequency</b>	Max. 1,200 switching cycles/hr

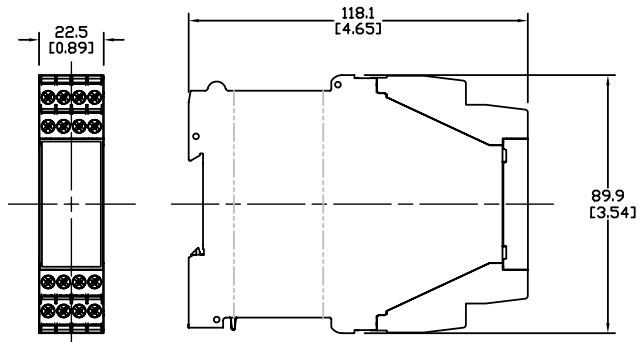
# Dold LG5929 Extension Module

## Wiring

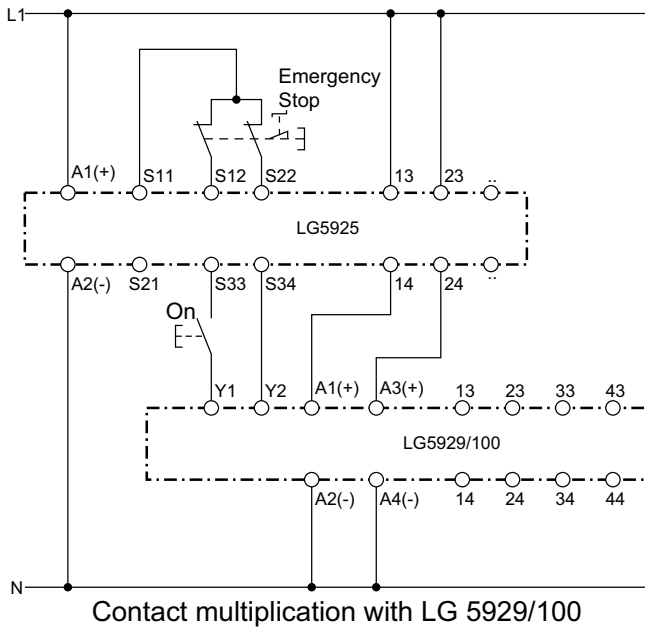
### LG5929 Block Diagram



## Dimensions mm [in]



## Applications



**Note:** This is a representative drawing. Depending on the LG5925 safety relay you select, different voltage sources may be required.

**\*Note:** When switching inductive loads, surge suppressors are recommended.

# Safety Products



***Warning: Safety products sold by AutomationDirect are Safety components only. The purchaser/installer is solely responsible for the application of these components and ensuring all necessary steps have been taken to assure each application and use meets all performance and applicable safety requirements and/or local, national and/or international safety codes as required by the application. AutomationDirect cannot certify that our products, used solely or in conjunction with other AutomationDirect or other vendors' products, will assure safety for any application. Any person using or applying any products sold by AutomationDirect is responsible for learning the safety requirements for their individual application and applying them, and therefore assumes all risks, and accepts full and complete responsibility, for the selection and suitability of the product for their respective application. AutomationDirect does not provide design or consulting services, and cannot advise whether any specific application or use of our products would ensure compliance with the safety requirements for any application.***